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4. IMPACT OF LITERACY ON ORAL LANGUAGE PROCESSING: IMPLICATIONS FOR SECOND LANGUAGE ACQUISITION RESEARCH

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In this chapter we describe a body of research on oral language processing that we believe has important implications for applied linguistics. This research documents the effects of literacy on human oral language processing. Studies in this area show that illiterate adults significantly differ from literate adults in their performance of oral processing tasks that require an awareness of linguistic segments. These studies provide evidence that the acquisition of the ability to decode an alphabetic script changes the way in which the individual processes oral language in certain kinds of cognitive tasks. At the same time, based on research establishing a clear reciprocal relationship between oral language processing skills and literacy, researchers on first language acquisition are extending the scope of their study to explore the way in which an individual's language competence is altered and extended by literacy itself. In this discussion, we describe the broad outlines of this new body of research and scholarship, and explore the implications for our understanding of second-language acquisition, and particularly for theories and research that explore the impact of "noticing" on SLA. We conclude by stressing the social and theoretical importance of including clearly-identified illiterate adults in our growing database on second language acquisition research.

Impact of Alphabetic Literacy on Oral Language Processing

In the past 10 years, immigrant and refugee English language learners with limited formal education have become a critical mass in many cities in North America and adult illiteracy is very high worldwide. Sadly, some 799 million people are still illiterate. Two-thirds of them are women, and more than 100 million children have no access to school (UNESCO, 2004). Interrupted or limited formal schooling is common among English language learners in U.S. public schools. In 1993, Fleischman and Hopstock found that 20% of English language learners at the high school level and 12% at the middle school level had missed two or more years of schooling since age six. Jamieson, Curry, and Martinez (2001) found that among

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newcomer Hispanic students ages 15 to 17, more than one-third are enrolled below grade level and are not literate in Spanish. However, despite low literacy, people around the world learn not only one, but often multiple languages. Multilingualism is the norm in many unschooled societies (Hill, 1970). Given the fact that illiteracy and multilingualism are common occurrences world wide, we believe that an adequate theory of SLA should account for the learning experiences of illiterate and low-literate multilinguals, and particularly, that much can be learned from the study of the L2 oral abilities of such learners. In this chapter, we review the work of first language acquisition (FLA) researchers and scholars who have examined the relationship between the acquisition of literacy in an alphabetic script and the ability to process oral language in terms of the formal linguistic segments encoded in that script. We consider the relevance of this research on first language for research on SLA and second language teaching. We focus specifically on a target audience of adult second language learners who are not literate in any alphabetic script, in any language.

The Construct of Literacy

Literacy is a complex construct. Ravid and Tolchinsky (2002) state that the mastery of written language involves two aspects: mastery of (1) written language as discourse style (that is, the recognition that the language used in writing is basically different from the language used in speech, and further, that there are many varieties of written language), and (2) written language as notational system (the recognition and ability to produce the representational system used in writing). Verhoeven (1994) also divides literate competence into components: grammatical, discourse, (de)coding, strategic, and sociolinguistic competence. Verhoeven's grammatical competence, "mastery of phonological rules, lexical items, morphosyntactic rules and rules of sentence formation" (p. 487), and his coding and decoding competence seem more or less equivalent to Ravid and Tolchinsky's "literacy as notational system." His discourse, strategic, and sociolinguistic competence seem equivalent to Ravid and Tolchinsky's notion of literacy as discourse style, which has also been the focus of such researchers as Biber (1988), Biber and Hared (1991), and Biber, Reppen, and Conrad (2002).

Similarly, Wiley (in press) states that research can be divided into two major orientations to the study of literacy: the "autonomous" orientation, which focuses on the formal properties of encoding and decoding text along with the individual cognitive consequences of this, and the "social practices" orientation, which views literacy not as an individual property, but as an activity deeply embedded in social relationships. Wiley includes as proponents of the first orientation Ong (1982), Olson and Torrance (1991), and Goody (1987), and as proponents of the second, Heath (1983), Street (1995) and Gee (1991, 2001). Although Wiley discusses these two orientations as somewhat antithetical, we follow Ravid and Tolchinsky (2002) in viewing them as more complementary, and relating to different components of literacy itself.

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In this chapter, we focus on only a part of the large construct of literacy: the part that Ravid and Tolchinsky (2002) refer to as "notational system," and Verhoeven (1994) describes as the two literacy components of "(de)coding" and "grammatical competence." We are particularly interested in the relationship between mastery of the notational system and oral language processing skills. We further target the abilities of adult illiterates—and, ultimately, the oral skills those individuals bring to the process of second language acquisition.

Studies on the Oral Processing of Illiterate Individuals

Oral Processing and Child Literacy

A robust body of research and scholarship in several related disciplines has focused on the relationship between oral linguistic awareness and literacy in monolingual children. We refer the interested reader to the work of the "autonomous" and "social practices" scholars referenced earlier. In research on child language development, it has long been acknowledged that young children are not aware of, for example, words as phonological entities until about the age of six or seven, the age at which they also become literate; Kolinsky, Cary, and Morais (1987) cite here the work of such scholars as Piaget (1979), Vygotsky (1962), and Berthoud-Papandropoulou (1978). Olson (2002), for example, describes empirical evidence in his own and his students' work that supports the view that prereading children believe that words represent entities themselves, and not linguistic abstractions. His team has conducted studies showing that prereading children assume that written signs represent events and meanings rather than words or sentences about those events. For example, a prereading child asked to write "cat" writes one scribble; when asked to write two cats, he writes two scribbles; three cats is three scribbles. No cats is a wave of the pencil in the air and a statement such as, "There's no cats so I didn't write anything." The child is shown a card that says "three little pigs" and someone reads that phrase. Then one word is covered up and the child is asked to guess what it says now. The child says "'two little pigs".' The child assumes the text relates to objects and events, not language *about* objects and events. Olson concludes that the preliterate child does not have the concept of "word."

Although metalinguistic awareness of such entities as "words" and "phonemes" seems to be related to literacy in child language development, there has apparently not been a consensus as to the *directionality* of this relationship. Does the increasing linguistic awareness of the cognitively maturing child provide the foundation upon which literacy may be developed? Or does literacy produce children's linguistic awareness?

Ravid and Kolchinsky (2002), in proposing a model of "linguistic literacy" that we describe next, maintain neutrality on the question of directionality of causality, even as they stress the strong connection between children's oral language awareness and their acquisition of literacy. They summarize research on the relationship between children's phonological and morphological awareness and learning to read and write this way:

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> We do not claim that there is a unidirectional, cause-and-effect relationship between oral language awareness of any dimension, on the one hand, and linguistic literacy, on the other. Rather, specific aspects of language awareness, especially phonological and morphological awareness, both promote and are promoted by learning to read and write. They do so by establishing links between the internal representation of phonemes, syllables and morphemes and their written representations (Rubin, 1988; Fowler & Liberman, 1995; Goswami, 1999). Concomitantly, written representations modify these very same internal linguistic representations (Gillis & deSchutter, 1996; Levin et al., 2001; Tolchinsky & Teberosky, 1998). (Ravid & Tolchinsky, 2002, p. 432)

The assumption of most researchers on child language development and child reading development seems to have been that the development of reading depends on prior phonological awareness. Verhoeven (2002, p. 487), for example, seems to make this assumption: "readers activate speech codes during the decoding process – even in morphemic writing systems such as the Chinese. As such, literacy acquisition depends critically upon a child's speech processing skills" (Snowling, 1998).

Reading researchers such as Thompkins and Binder (2003) seem to make the same assumption, namely that successful development of reading skills depends upon prior phonological awareness. Noting that it is well-known that phonological awareness and reading level correlate strongly in studies of children, they propose to examine the same relationship among adults who are functionally illiterate, and compare this to that of children. They compare the phonological awareness and short-term memory skills of 60 functionally illiterate adults matched with a group of 99 children of similar reading abilities. Interestingly, they frame the results of the study in terms of identifying which phonological and memory skills account for the greatest amount of variance in reading level scores. In other words, implicit in their analysis is the assumption of directionality in the relationship: that it is reading level that is the dependent variable, and phonological awareness that is the independent variable.

However, there are other scholars in child language development who take the opposite position: that it is the development of literacy that causes increased phonological awareness. Berthoud-Papandropoulou (1978) stated that the development of children's awareness of words as phonological forms depended on their exposure to written words. Indeed, many of the scholars who Wiley (in press) lists as having an "autonomous" orientation to the study of literacy (e.g., Olson, 2002) argue quite strongly that it is the process of becoming literate that provides individuals with an awareness of the linguistic units encoded in the notational system of the written language[1]. Discussing the impact of literacy on their cognition, Olson (2002) states: "Children's important discovery is that their own and others' more or

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less continuous speech may be thought of as a sequence of lexical items or 'words'" (p. 158).

But perhaps it is not possible to establish directionality between phonological awareness and literacy development when working only with a population of children, where age/cognitive development and literacy level are typically confounded. Perhaps the directionality of this relationship is best explored in carefully designed studies of adult illiterates.

Oral Processing and Adult Illiteracy

As established earlier, there are a great many illiterate adults throughout the world, so it is quite feasible to study highly comparable groups of adults whose only distinction is their ability to encode/decode written language. When such groups differ in the linguistic awareness they display in processing oral language, then it seems much more likely that the causal factor is the mastery of the (en/de)coding skill itself. Importantly, such groups are often comparable in terms of the social practices of their local cultures; thus, it seems highly likely that it is decoding/encoding skill alone, and not their community of social practice, that is the differentiating variable that affects the way they process oral language.

Initially, research on the oral processing abilities of adult illiterates seems to have been carried out in Brazil by a team of researchers in the field of cognitive psychology and neuropsychology, with José Morais a frequent team member. These studies present evidence that the acquisition of the ability to decode an alphabetic script changes the way in which the individual processes oral language, as seen in their performance of certain kinds of cognitive tasks. Specifically, these researchers claim that literacy in an alphabetic script appears to significantly affect adults' performance of oral processing tasks that require an awareness of linguistic segments. These research studies in the 1970s and 1980s were published in such journals as *Cognition, Cognitive Neuropsychology,* and *Applied Psycholinguistics*. The primary goal of these researchers was to document the incidence of cognitive impairments of various kinds within a larger population of adults in Brazil and Portugal, many of whom were also illiterate; to do this, they needed to establish a baseline of performance by normally functioning illiterate adults. In such a study documenting the oral language processing abilities of normal illiterate adults, Morais, Cary, Alegría, and Bertelson (1979), and Morais, Bertelson, Cary, and Alegría (1986) found that whereas many of them performed oral tasks focusing on rhyme or on the analysis of speech into syllables just as well as literate adults did, illiterate adults performed far worse than literate adults on oral tasks requiring segmental analysis, particularly at the level of the phoneme. A typical oral task that was relatively easy for literate adults and almost impossible for illiterate adults asked them to add or delete an individual consonant at the beginning of a spoken word. Another task, assessing "phonological fluency," asked them to list all the words they could think of that started with a named phoneme (e.g. /t/); again, illiterate adults had trouble doing this task. The researchers argued that an individual's mastery of an alphabetic script, which requires the establishment of a grapheme-phoneme

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correspondence, establishes the ability of literates to process oral language in terms of the linguistic segment "phoneme." Illiterates, who lack the linguistic construct "phoneme," cannot perform oral tasks that require the awareness of that construct. In a similar study focusing on oral processing of words rather than phonemes, Kolinsky, Cary, and Morais (1987) examined the word awareness of adult illiterates and found that awareness of phonological length of words was related to degree of literacy, not age and its correlate, cognitive maturation.

A possible criticism of these Brazilian studies was that the two subject groups might have differed along dimensions other than their mastery of the grapheme-phoneme correspondence (e.g., local culture, school experience, knowledge of the world, and other analytical abilities promoted in general in school). In other words, the two groups may have been situated in different networks of social practice, and this itself could account for differences in their oral processing abilities. To address this possibility, and also to explore the influence of a nonalphabetic as opposed to an alphabetic script, Read, Xhang, Nie, and Ding (1986) focused on two comparable groups of adult Chinese participants, both educated and both living in a similar context of social practice. One group (n = 18) had become literate only in Chinese characters, having been educated in schools that had not yet adopted the Chinese alphabetic script (Hanyu Pinyin). The second group (n = 12), comparable to the first in level of education, age, and social group, had become literate in both Chinese characters and the alphabetic script. Their differential exposure to an alphabetic script was an accident of history and social change, and not to any differences in their cognitive ability or their social situation. Both groups were asked to perform oral tasks in Chinese; they were asked to add or delete a single consonant (*d, s, n*) at the beginning of a spoken syllable. All syllables and targets were possible words in Chinese (e.g., /an/, /san/); some targets were words and some were nonwords. The results showed that on this task the adults who had alphabetic literacy significantly outperformed those who did not. Where the targets were nonwords, the literate adults' accuracy was 93% compared to 37% for the illiterate group; for targets that were words, the literate adults' accuracy was 83% compared to 21% for the illiterates. The authors conclude that the ability to segment oral language develops *as a consequence* of the process of learning to read and write alphabetically. A similar study on Chinese readers by de Gelder, Vroomen, and Bertelson (1993) replicated Read et al.'s results.

Other studies were subsequently carried out in Spain, Portugal, and Brazil, to compare the performance of adults who were, or were not, literate. For example, Adrian, Alegría, and Morais (1995) administered an extensive battery of oral tasks to a group of 15 illiterate adults in Spain, comparing their performance to that of two other groups: one a group of "poor readers" and the other a group of "readers." The illiterate participants scored as well as the literate ones on a phonetic discrimination task asking participants whether pairs such as /me-me/ or /sa-ta/ were different. This showed that literacy did not affect phonological sensitivity. Half the illiterate participants did very well on rhyming tasks, so literacy had a negligible effect on this skill. However, the illiterate participants got very low scores on all tests that should require conscious awareness of phonemes (matching, monitoring, deletion, and

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reversal). They also were significantly worse than the literate adults on oral tasks requiring them to reverse words and syllables.

Perhaps the best-designed and most tightly-reasoned study in this area we found was Reis and Castro-Caldas (1997), who studied two groups of women in a fishing community in the south of Portugal, matched for intelligence and family/cultural environment, but differing solely in terms of their ability to know the phonemic value of a set of graphemes. Postulating that illiterate adults rely heavily on semantic strategies rather than phonological strategies to perform certain tasks, Reis and Castro-Caldas state: "Learning to match graphemes and phonemes is learning an operation in which units of auditory verbal information heard in temporal sequence are matched to units of visual verbal information which is spatially arranged" (p. 445). Reis and Castro-Caldas posit that literate individuals develop a strategy where visual-graphic meaning is given to units that are smaller than words, and so have no semantic meaning. These segments are introduced sequentially in a working memory system with a new content of visual experience. (To spell a word, we can evoke a visual image of the letters. Then we play with those written symbols, each coded to a sound, to form pseudowords with no semantic meaning.) This involves conscious phonological processing, visual formal lexical representations, and their associations—all of which are strategies available to literate and not illiterate individuals. To explore this general postulate, Reis and Castro-Caldas conducted three experiments: (a) an oral word/pseudoword repetition task, (b) an oral word-pair memory task in which some pairs were semantically-related and some were phonologically-related, and (c) verbal fluency tasks that were either semantically triggered (e.g., names of animals) or phonologically triggered (e.g., words that begin with /p/). Results showed that the illiterate group had significantly greater difficulty than the literate group with repetition of pseudowords but did equally well on repetition of frequent words. The illiterate group did significantly better on the semantic word pairs than the phonological ones, and on the semantic verbal fluency task than the phonological one. However, they did comparatively worse than the literate group on both semantic and phonological tasks in Experiment 2 and 3, suggesting to the experimenters that the illiterate subjects used strategies that were good for semantic processing, but not for phonological analysis, whereas literate individuals were able to use parallel semantic and phonological strategies at once, which greatly improved their accuracy. Reis and Castro-Caldas believe that semantic processing is implicit, and learning to read and write brings an explicit dimension to the process of phonological processing. They conclude that absence of the ability to associate grapheme and phoneme decreases the efficiency of explicit phonological processing of oral language in adult life: "The missing of a single skill (grapheme-phoneme association) interferes significantly in the higher development of the language system" (p. 449).

Olson (2002) cites an ongoing study by Alice Moro at the University of Calgary showing that illiterate adults do the same thing children do when asked to count words on the page: shown a text that is simultaneously read to them that said 'three wild horses,' and then seeing one of the words covered up, 5 of 10 illiterate adults said it meant 'two wild horses.' Because the degree of illiteracy of these

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adults in Calgary is probably not absolute, but partial, given their social and physical environment, it is not surprising that half of these adults did not make this same mistake. But the fact they made it at all, and literate adults do not, provides support for the notion that the awareness of the linguistic construct "word" is a product of becoming literate.

Dellatolas, Willadino-Braga, Souza, Filho, Queiroz, and Deloche[2] (2003) explore the impact of degree of illiteracy on a wide range of phonological skills, verbal and visual memory, and visuospatial skills. The participants in the Dellatolas et al. study were 97 normally functioning self-described illiterate adults and 41 children (ages 7–8) in Brazil. The degree of literacy of all the participants was measured by asking them to read 16 short words and identify capital letters and numbers. Participants who could not read a single word were placed in a "nonreader" group, and those who could read at least one word were placed in a "reader" group. Twenty tests were administered individually to each participant in the study. These included measures of word and nonword repetition, semantic and phonological fluency, rhyme identification, initial phoneme deletion, and various memory span tests. Results replicated many of those described in the previous studies. Literacy significantly improved performance on phonological fluency and initial phoneme deletion tasks. A stepwise regression analysis showed that scores on four measures could classify 86.8% of the participants as readers or nonreaders; these were phonological fluency, initial phoneme deletion, visual recognition, and (with opposite sign) digit span. Illiterates' ability to name letters was significantly related to phonological fluency and initial phoneme deletion. Oral repetition was relatively easy overall for illiterate individuals, but they did have great difficulty with repetition of long nonwords, a finding that other studies have also replicated. The authors suggest that the ability to repeat long nonwords is an important language learning skill, because it means the individual can hold words they do not understand in short-term memory, giving them an opportunity to ask or search for a meaning.

These studies, growing out of research in the field of cognitive psychology and neuropsychology, and focusing on the impact of literacy on the oral language processing of adults, provide a growing body of evidence suggesting that the acquisition of grapheme-phoneme correspondence in learning to read an alphabetic script, and also the acquisition of the abstract concept of "word" acquired in the process of learning to read, both provide important cognitive tools for the processing of oral language. They seem to provide clear evidence that it is learning the skill of decoding an alphabetic script that produces these changes in cognitive processing.

A Broadening Agenda for First Language Acquisition Research

There is recent evidence that the fields of child language acquisition and child reading research are expanding their related agendas to include the study of the relationship between children's oral language processing and acquisition, and their acquisition of literacy skills. In 2002, Ravid and Tolchinsky published a position paper in the *Journal of Child Language*, proposing a new construct of "linguistic literacy." "Linguistic literacy" is defined as ". . . a constituent of language

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knowledge characterized by the availability of multiple linguistic resources and by the ability to consciously access one's own linguistic knowledge and to view language from various perspectives"(p. 419–420). The key property of linguistic literacy is rhetorical flexibility, or adaptability: being able to produce varied linguistic output attuned to different addressees and contexts and to create linguistic representations that can be manipulated for metalinguistic reflection. Linguistic literacy is late acquired, by school-age learners, as they add the major linguistic modality of writing to the earlier-acquired modality of speech. In the process, they become more aware of language itself.

Ravid and Tolchinsky (2002) are cited earlier in this chapter as stating that linguistic literacy has both a discourse dimension[3] and a notational code dimension. They discuss at some length the discourse dimension, which relates to the increasing variation in the discourse styles mastered by the learner[4]. Here however we focus on their discussion of the notational code, which for English is an alphabetic system. Alphabetic systems are said by these authors to have four types of knowledge systems to be mastered: phonology (grapho-phonemic link), orthography (fonts, upper/lower case), morpho-phonology (emic/etic distinctions like flap /t/), and morphology (past tense marker in English). Learning these systems entails constructing an internal model of the units of spoken language modeled by the features of the written script. For example, punctuation involves marking word boundaries and sentence boundaries. They state:

> Written text conventions promote metalinguistic thinking in various linguistic domains such as sound/letter correspondence, word and sentence boundaries, and appropriate grammatical constructions (e.g. past perfect in English, passé simple in French, or optional bound morphology in Hebrew). . . . the reciprocal character of speech and writing in a literate community makes it a synergistic system where certain features (e.g. basic syntax) originate in the spoken input, while others, such as complex syntax and advanced and domain-specific lexical items, originate in the written input. Together, however, they form a "virtual loop" where speech and writing constantly feed and modify each other. (p. 430)

Ravid and Tolchinsky suggest that before speakers of a language become literate, they focus out of necessity on the meaning of their utterances, and not on the linguistic form of language. But with literacy, those individuals begin to develop an explicit and analytical awareness of language itself. With that awareness comes increasing cognitive control. Links are established between the internal representation of phonemes, syllables, and morphemes and their written representations, and these newly articulated representations become the locus of increasing control.

The position paper of Ravid and Tolchinksky (2002) is followed in the same issue of the journal with 10 responses from a diverse group of leading scholars on child language development, among them Berman (2002); Verhoeven (2002), Biber,

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and Reppen, and Conrad (2002). Their responses suggest that the field of child language acquisition will be affected by Ravid and Tolchinsky's new construct. For example, Kail (2002) points out that the proposed model can help explain patterns of French L1 acquisition. In French, there is a particularly large gap between the oral and written code, for example, in verbal number agreement: *fille/filles, genous/benous, il chante/ils chantent*. Children initially base their sentence interpretations on word order, and only later do they take morphology into account; a central puzzle has been what it is that causes children to change the way they interpret oral input. Kail (2002) states:

> The developmental change in French children's processing could be explained by their increasing mastery of morphological cues supplied by growing knowledge of the written code which is clearer and more regular than the oral one. It seems reasonable to assume that linguistic literacy makes French morphology more accessible and more consistent providing a stable representation for agreements. . . we have to predict that literacy may cause the child to notice conflict cases in the input (for example between word order and morphology) she has never noticed before. (p. 465)

Miller (2002) explores the implications of Ravid and Tolchinsky's construct for innatism itself, as the central approach to the study of child language. Considering the fact that complex syntactic structures such as the full relative clause system in English are acquired very late, he points out problems for nativist theories of language acquisition, which

> assume a large endowment of innate linguistic knowledge, without which it would (allegedly) be impossible for children to acquire the complex structures of any language. Once the complexities of written language are seen as learned over a longish period of schooling, once spontaneous spoken language is recognized as being relatively simple and once it is recognized that children do receive negative evidence (Sokolov & Snow 1994), nativist theories lose their *raison d'etre*. This is the most important consequence of paying attention to literacy and the distinction between spoken and written language. (p. 473)

To summarize, then: researchers and scholars pursuing studies independently of one another in the different fields of child language acquisition and adult cognitive processing are at the same point in time reaching similar conclusions about the central interconnectedness of the acquisition of literacy in an alphabetic language and human beings' oral processing of language. We are particularly interested in the research that establishes a clear picture of what it is that illiterate adults can and cannot easily do in processing oral language. This gives us a much clearer idea of the abilities they bring to the acquisition of a second language. Those abilities appear to be qualitatively different in certain key areas from abilities

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commonly assumed by SLA researchers and theoreticians to be universally present in second-language learners.

So what are the implications of this new body of knowledge for current second-language acquisition research? What are the implications for the pedagogy of second-language learners who are not literate in any language?

Possible Implications for Research Agendas in Applied Linguistics

Much current research on second-language acquisition is guided by theories that assume that second-language learners are aware of linguistic segments. Indeed, Schmidt's Noticing Hypothesis (Schmidt, 1994, p. 17) claims that "noticing is a necessary and sufficient condition for converting input to intake" and that *conscious noticing* is necessary for learning to take place. The research reviewed in this article, although largely carried out in the participants' native languages, is intriguing with respect to the Noticing Hypothesis. If L2 learners who are not literate in any language do not consciously notice segmental linguistic units in oral input in the second language—(a reasonable assumption, given that the research shows they don't notice them in their native language)—then the Noticing Hypothesis would predict that they cannot acquire an L2 at all. And yet it is clear that many illiterate adults do acquire L2s through oral input. For example, illiterate Somali adults acquire very good fluency in oral English, their L2, apparently without possessing some key metalinguistic skills. One possibility, of course, is that the Noticing Hypothesis is just wrong—that humans don't need to notice L2 structures to acquire them. This might be Krashen's response (Krashen, 1982). But we can think of two other possibilities, either of which might reconcile these research results with the Noticing Hypothesis. One possibility is that the ability to consciously notice and analyze oral L2 input in terms of segmental linguistic units holds only for alphabetically literate L2 learners. Thus, illiterate adults retain the ability to unconsciously internalize the L2, in the same way they internalized their L1; once adults become literate, they must consciously notice an L2 structure to internalize it. Another possibility—one that is suggested by the Ravid and Tolchinsky article—is that the Noticing Hypothesis applies only or primarily to the acquisition of that set of more complex syntactic structures which characterize the written language—that is, it applies to the acquisition of linguistic literacy in the L2. In other words, a core set of simple syntactic structures may be acquired unconsciously and not require noticing; an illiterate L2 learner may become quite fluent in the use of these structures orally. However, the more complex set of syntactic structures characteristic of written English, and the full mastery of linguistic literacy in the L2, may require conscious attention and noticing if they are to be acquired. It would appear that the exploration of these alternative possibilities may generate some interesting SLA research and theory-building in the future.

A second implication for SLA research has to do with our interpretation of those recent studies that have focused on the influence of enhanced input or corrective feedback on the acquisition of core syntactic structures of an L2. Indeed, all SLA studies exploring Focus on Form (e.g., Doughty & Williams, 1998) should

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now be reconsidered. Such studies have typically targeted core syntactic structures such as simple verb tenses, question formation, and negation. The assumption of work in this area is that all L2 learners have the metalinguistic awareness to notice enhanced input or corrective feedback that is focused on such L2 forms. But if L2 learners do not have awareness or ability to consciously manipulate phonemes, morphemes, and words in the L2, then they cannot notice enhanced input or corrective feedback targeting those phonemes, morphemes, and words. For example, if corrective feedback adds a phoneme to a word they have just produced (e.g., /laik/, /laikt/, /bey/, /beyz/), they may not have the oral language processing tools to notice the difference between their own word and the corrected word, and then add the phoneme to the word in a subsequent utterance. Similarly, some studies we have reviewed in the section on oral language processing and adult illiteracy show that illiterate adults have a hard time reversing the order of syllables and words; if such individuals receive corrective feedback in L2 that inverts subject and auxiliary to form a question, will they be able to notice this reversal, and implement it in their own output? Such questions have led to emerging research on the SLA processes of relatively illiterate adults. Bigelow, Delmas, Hansen, and Tarone (under review) find that Somali adults who have low literacy levels are significantly less able to correctly recall oral recasts of their erroneous English L2 questions than similar learners with higher literacy levels.

There are surely also implications of the research on oral language processing and literacy for other areas of SLA research. For example, how do the oral processing constraints of illiterate adults interact with the cognitive processing strategies that Clahsen, Meisel, and Pienemann propose underlie the Multidimensional Model's stages of acquisition (see Clahsen, Meisel, & Pienemann, (1983); Meisel, Clahsen, & Pienemann (1981); Pienemann & Johnston, (1987)). Do illiterate adults follow the same stages of acquisition as the literate adults in their research? Space does not allow us to explore such implications in this chapter, but we hope that others will take up such considerations in future publications.

Finally, there may be important implications of this research for our understanding of the impact of literacy in an alphabetic script upon the acquisition of a lexicon in a second language. Reis and Castro-Caldas (1997) suggest that the ability to hold a pseudoword in the short term phonological store is directly related to the ability to acquire new lexical items in a language; they argue that the phonological short term memory of illiterate adults is negatively impacted and that this could affect lexical acquisition. Nation (2001) cites SLA research with literate L2 learners that shows that phonological memory and L2 lexical acquisition are related. But illiterate adults do acquire L2 words. We need research to determine whether illiteracy negatively affects adults' ability to acquire an L2 lexicon, and also research to identify their lexical acquisition processes.

Possible Implications for Research Agendas in Second Language Pedagogy

First, the research summarized in this chapter shows that illiterate adults have specific strengths (e.g., phonological sensitivity and rhyming) as well as

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specific weaknesses in their oral language processing (e.g., phonemic discrimination). Pedagogic strategies for illiterate adults should consider these findings both when teaching L2 oral skills and L2 literacy skills. For example, L2 teachers may wish to build on oral traditions in the cultures of their students that use rhyming (a strength) to build language awareness in the oral or written modes in the L2. Teachers might also wish to provide adult illiterate students in their classrooms who are just acquiring grapheme/phoneme awareness with training involving manipulation of linguistic segments to help them build connections between the oral and written media. Teachers can engage learners through whole-group, peer, and individual discussion and then make links to text. Teachers reading aloud to students from multiple genres may give meaning, purpose, context, and enjoyment to adult learners for whom text has always been a source of discomfort or simply avoided. Teachers will find engaging with adults, who bring mature cognitive abilities to the process of becoming literate, to be different from working with children, yet illiterate adults may still need to be explicitly taught the basics of grapheme-phoneme correspondence and word boundary, both in writing and orally, before moving on to more top-down literacy practices.

Conclusion

If SLA research is to account for human capacity for SLA, and if SLA research is to have implications for L2 pedagogy of learners who are not literate, then SLA studies must include illiterate adults. This research will be useful in further determining where such learners' strengths and weaknesses lie, and this in turn will have implications for teachers of adolescents and adults with limited formal schooling. If L2 pedagogy with illiterate older students is to be more effective, then we should explore the efficacy of teaching strategies that build oral and contextual support for development of grapheme/phoneme and other linguistic segmentation skills. Of course, this does not preclude strategies that that give literacy instruction a meaningful context in which it unfolds in the classroom or take into account the uses students have for expanded literacy in their lives.

It will take more time and effort for SLA researchers to study illiterate adults. It may be challenging for some SLA researchers to focus their research efforts outside the walls of undergraduate world language programs or university intensive English centers. There are issues of access to illiterate adult learners, which must be hard earned through long-term trusting relationships, and there is difficulty obtaining informed consent from participants for whom verbal consent is the only option. Recruitment may be challenging when potential participants discover that the focus on the research deals with one of their weaknesses, not being able to read or write. (These concerns are outlined in Bigelow & Tarone, in press). However, given the results of the studies and scholarship reviewed here and their potential implications for second language learners, it is vital for our field to broaden its scope for both theoretical and practical reasons. We simply cannot claim that SLA theories apply widely to all second language learners unless we study a greater range of the circumstances in which L2 learning occurs and thereby expand our knowledge base.

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Notes

1. We point out here that this is not the same thing as arguing, as Ong and Goody have done, that mastery of an alphabetic script is essential to logical thinking! Awareness of the boundaries of linguistic units in the stream of speech is one thing: Logical thinking is quite another.

2. The results of this study are also reported in Loureiro et al. (2004).

3. In the discourse dimension, linguistic literacy makes variability (both user-related, and context-dependent variation) both accessible and controllable. It enables the language user to increase their control over register (distinctions that express social dimensions like power, authority, distance, politeness), genre (text types defined by function, communicative purpose, and sociocultural practice), modality (oral vs. writing, with its lack of audience, stable language signal, more control over linguistic output).

4. Here Ravid and Tolchinsky rely heavily on the work of Biber and his colleagues (Biber 1988; Biber et al., 1991) who show that the registers of oral and written language are basically different, and that the syntactic constructions used in written registers are typically more complex, and the information structure of written registers more dense.

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Adrian, J. A., Alegría, J., & Morais, J. (1995). Metaphonological abilities of Spanish illiterate adults. *International Journal of Psychology, 30*, 329–353.

This study, carried out in Spain, compares the metaphonological abilities of 15 illiterate adults with those of two groups: poorer readers and better readers. All were given a battery of tests, including a reading test, phonetic discrimination (e.g., *ta-sa*: same or different?), rhyme detection (e.g., *mepu/pepu*: rhyme or not?), syllable detection (e.g., is [pa] contained in [pati]? Or, if you delete [pa] from [pati], what do you have?), phoneme detection (e.g., do these words contain the same phoneme? '*kar/kus*'), syllable deletion (e.g., if we subtract [de] from the word [kade], we have …?), phoneme deletion (e.g., if we subtract [t] from the syllable [tal], we have …?), word reversal (e.g., say *zanahoria rota* backwards), syllable reversal (e.g., say [taro] backwards. Ans: [rota]), phoneme reversal (e.g., how would you say [los] backwards? Answer: [sol]).

All the participants did extremely well on the phonetic discrimination task. However, the illiterate participants got very low scores on all tests that should require conscious awareness of phonemes (matching,

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monitoring, deletion, and reversal of phonemes). The authors conclude that phonemic awareness (ability to segment speech on the basis of phonemes) is affected by the degree of literacy of these adults. Phonological sensitivity (ability to classify two utterances as same or different phonetically) is a different skill from phonemic awareness, one that literacy does not affect. Syllable tasks were easier for illiterates than phoneme tasks, though still more difficult for illiterate than for literate participants. The rhyming tasks were surprisingly difficult for both the illiterates and the poorer readers; this may have been because of rapid changing of tasks in the experimental design. (Authors cite other studies that show that illiterates can reach quite high levels of performance in rhyming sensitivity, cf. Bertelson, et al., 1989; Morais, et al., 1986).

Dellatolas, G., Willadino-Braga, L., Souza, L., Filho, G., Queiroz, E., & Deloche, G. (2003). Cognitive consequences of early phase of literacy. *Journal of the International Neuropsychological Society 9*, 771–782.

The article begins by citing research demonstrating that neuropsychological test performance depends on literacy, even for tasks that do not directly involve reading and writing. Adult illiterates scored lower than literates on such tasks as repetition of pseudowords, memory of pairs of phonologically related words, generation of words according to a phonological criterion, verbal abstraction, orientation, figure matching and recognition, naming line drawings, components of calculation and number processing. Literacy status did not affect verbal list delayed recall, nonverbal abstraction, category fluency, or counting elements of small sets.

The study reported herein addresses the question: Which specific cognitive processes are reading acquisition dependent, in adults and children? The study compared the performance of 97 adults and 41 children (ages: 7–8) living in Brasilia; those who could not read one of 16 common short words were classified illiterate, and those who could read at least one of these words were classified literate. Twenty tests were administered in individual intereviews: repetition of words and nonwords, semantic verbal fluency, phonological verbal fluency, visual recognition memory of nonsense figures, rhyme identification, minimal pairs phonetic discrimination, initial phoneme deletion, digit span, span for familiar monosyllabic words, span for monosyllabic nonwords, figure recall, embedded figures, counting dots, counting backwards, word list recall. A two-way ANOVA was run with adult/children and reader/nonreader as independent variables, and all the cognitive scores as dependent variables. Readers did better than nonreaders on all tasks except four (oral repetition of short and long words, short nonwords, digit span). The literacy effect for adults and children was not significantly different, except for counting backwards, which all nonreading children failed. Literacy significantly improved performance on phonological fluency and initial phoneme deletion

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tasks. The authors conclude that literacy does not affect the perceptual level, but the phonological fluency and initial phoneme deletion tasks both involve speech segmentation abilities, and these significantly relate to literacy level. Initial phoneme deletion with cluster onset (CCV) were particularly difficult for illiterates. The authors discuss the lower ability of illiterate adults to repeat nonwords, suggesting that the ability to hold a word one does not know (temporarily a 'nonword') in short term memory while one searches for its meaning is an important skill to have in acquiring new word meanings.

Olson, D. (2002). What writing does to the mind. In E. Amsel & J. P. Byrnes (Eds.), *Language, literacy, and cognitive development: The development and consequences of symbolic communication* (pp. 153–166). Mahwah, NJ: Erlbaum.

This paper begins with Olson's claim that "learning to read is to an important extent a matter of learning how to analyze one's speech in a new way, a way compatible with the properties of the writing system. Thus, the child has to learn to hear the sounds represented by letters in their own and others' speech, to hear the *b* represented by the letter /b/ in 'baby,' and 'bath'. . . . To segment words, the child has first to learn that an utterance can be segmented into words, and that knowledge too may be acquired in the process of becoming literate" (p. 156).

Olson cites research that supports this claim, beginning with a study by Ferreiro (1994) showing that prereading children interpret written words in the same way they interpret pictures. They do not know, until they learn to read, that representations of words require arbitrary signs that can be combined to make different words. He cites examples from Homer and Olson (1999). For example, a prereading child asked to write "*cat*" writes one scribble; when asked to write two cats, he writes two scribbles; three cats is three scribbles; no cats is a wave of the pencil in the air and the statement, 'there's no cats so I didn't write anything'. In another case, a prereading child is shown a card that says 'three little pigs' and someone reads that phrase. Then one word is covered up and the child is asked to guess what it says now. The child says 'two little pigs.' The child assumes the text relates to objects and events, not language *about* objects and events. They do not have the concept of 'word.' (He later cites an ongoing study by Alice Moro at the University of Calgary where illiterate adults did the same thing: Shown a text read to them that said 'three wild horses,' and then, seeing one of the words covered up, 5 of 10 of them said it meant 'two wild horses.') Olson also goes on to claim that thinking about words as they occur in writing leads to our notion of grammatical standards, which we use to correct ourselves and others.

Olson concludes:

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> Writing is what introduces our speech to us, revealing our speech as having a particular structure. Children do not know that they speak words, that is, that the flow of speech can be thought of a as a string of lexical items. But children in an alphabetic society do come to think about language, mind, and world in terms of the category systems employed in writing. To paraphrase Whorf (1956), we dissect language along lines laid down by our scripts. (p. 164)

Ravid, D., & Tolchinsky, L. (2002). Developing linguistic literacy: A comprehensive model. *Journal of Child Language, 29,* 417–447.

> This position paper proposes a construct called *linguistic literacy,* which is the ability to produce different language varieties appropriate to different addressees and contexts, and to create linguistic representations that can be manipulated for metalinguistic reflection. Children become more aware of language itself when they add the major linguistic modality of writing to the earlier-acquired modality of speech. The authors distinguish different degrees of consciousness and explicitness in the process of acquisition; for example, recognition is implicit identification, and awareness is conscious access, which learners may not be able to verbalize. The authors stress that they do not view either spoken or written language as primary, but emphasize the reciprocal relationship between the two; in a literate society, language structures may predominate ("originate") in one or the other modality but be used in the other. Initially, in language development, language knowledge is implicit because the speaker focuses on meaning and not form; however, learners later develop an explicit and analytic awareness of language itself, an awareness that is necessary for cognitive control to be exercised. As awareness grows, the learner reorganizes linguistic representations into more coherent and accessible forms. The authors cite longstanding research showing that various types of oral language awareness correlate with both basic and advanced literacy skills, and take the position that phonological and morphological awareness both promote and are promoted by learning to read and write. Links are established between internal representation of phonemes, syllables, and morphemes and their written representations. They posit that alphabetic systems have four types of knowledge systems to be mastered: phonology (grapho-phonemic link), orthography (fonts, upper/lower case), morpho-phonology (emic/etic distinctions like flap 't'), and morphology (past tense marker in English). Learning these entails constructing an internal model of the units of spoken language modeled by the features of the written script. This article is followed in the same issue of the journal with 10 responses written by leading researchers and scholars.

Reis, A. & Castro-Caldas, A. (1997). Illiteracy: A cause for biased cognitive development. *Journal of the International Neuropsychological Society, 3,* 444–450.

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This study explores the proposition that learning to read and write affects the way in which some language processing operations are performed. The study participants were sisters aged 50–70 living in a remote fishing village in Portugal; in their youth the oldest daughter had been kept home from school to mind younger siblings while younger daughters had gone to school and learned to read and write. After school, their social lives and social roles had been identical, and the need for reading and writing minimal.

These participants were studied in matched groups as they performed three experiments exploring three hypotheses: (1) repetition of pseudowords, which requires both explicit and implicit phonological processing, should be harder for illiterates than for literates; (2) in tasks that are solvable both by semantic content and knowledge of word form, illiterates will rely on knowledge of semantic content; (3) illiterates should have difficulty with tasks of verbal fluency based on language form (compared to literates) but not with tasks of verbal fluency based on semantic content. All three hypotheses were confirmed. In experiment 1: Repeating Words and Pseudowords, the participants were asked to repeat 24 highly frequent words and 24 pseudowords created by substituting consonants in words of the first group. An ANOVA showed no difference between the groups in ability to repeat meaningful words. Illiterate participants made significantly more errors repeating pseudowords than literates; 26% of their errors involved transforming pseudowords into meaningful words, something literates rarely did at all. For experiment 2: Word Pair Association, two sets of word pairs were developed. One set of word pairs was semantically related (e.g., *rose-carnation*) and the other set of pairs was words phonologically related (e.g., *mala-pala*). The tests were administered as directed on the Wechsler Memory Scale. The literate participants performed equally well on both types of word pairs, and overall significantly better than the illiterate participants. The illiterate participants performed significantly worse on the phonologically related word pairs than they did on the semantically related word pairs. In experiment 3: Verbal Fluency, participants performed two tasks. In the semantic fluency version, they had one minute to repeat the names of as many animals (subtask 1) and pieces of furniture (subtask 2) as they could think of. In the phonological fluency version, they had one minute to repeat as many words they could think of that began with /p/ (subtask 1) or /b/ (subtask 2).

All the participants did all the subtasks. The illiterate participants did significantly worse on the phonological fluency tasks than on the semantic fluency tasks. The literate participants did equally well on both types of task, and much better than the illiterate participants on all tasks. The authors conclude that in general, the illiterate participants used strategies that were good for semantic processing, but not for phonological analysis, whereas the literate individuals were able to use parallel phonological and semantic strategies at once. They also suggest that

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illiterate individuals cannot perform the mental operation of storing words in a short-term memory buffer that is phonologically structured.

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